Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (previously presented): A method for the determination of an acoustic impedance Z, comprising the steps of:

- arranging a probe with a means for acoustic stimulation and a microphone at the area to be measured;
- sending out acoustic signals over said means and receiving again over the microphone;
- transforming the received signals by the microphone into electrical signals for input to an analysis unit, in which the amount of the impedance Z will be determined;
- inputting a previously defined stimulation into a twoport chain transfer matrix as a calculation base for the impedance Z,
- wherein the voltage ratio between the stimulation and the impedance is described as a dimensionless transfer function in a form of a complex function of the stimulation frequency;
- generating a series of acoustic calibration signals by a number of known acoustic impedances covering different calibration scopes by means of the defined stimulation;
- recording the calibration signals received by the microphone and merging the electric values together with the respective voltage values of

the stimulation for the evaluation of the results of the respective transfer functions;

- merging together the transfer functions of the calibration signals into a an over-determined linear system of equations and solving the system of equations for calculating two coefficients; - determining the impedance Z, calculated by evaluating the transfer function under the defined stimulation by use of the two coefficients; and
- the analysis unit outputting the determined impedance Z to an external entity.

Claim 2 (original): Method of claim 1 wherein a loudspeaker is used as a mean for the acoustic stimulation.

Claim 3 (original): Method of claim 1 wherein the over determined linear system will be solved in terms of minimum squares.

Claim 4 (original): Method of claim 1 wherein at least two different impedances are used.

Claim 5 (previously presented): Method of claim 1 wherein a combination of hollow bodies and small tubes with defined dimensions and known impedances are used as calibrating impedances.

Claim 6 (previously presented): Method of claim 1 wherein a frequency generator is used for the stimulation by generating a broad band signal of white noise.

Claim 7 (original): Method of claim 1 wherein the transfer functions will be calculated by the division of the measured auto power spectrum of the stimulation through the average cross power spectrum between stimulation and impedance to be measured.

Claim 8 (previously presented): Method of claim 1 wherein two series connected twoport chain matrices are used, wherein the microphone is arranged between the output of the first twoport and the input of the second twoport.

Claim 9 (previously presented): Method of claim 8 wherein the elements of the two chain matrices are reduced to three base parameters, which are evaluated by measurements of at least three calibration impedances with known impedances and the respective solution of the over determined linear system of equations to further determine the impedance to be measured by measuring of the transfer function as a division between the stimulation and the microphone signal by use of the base parameters.

Claim 10 (previously presented): Method of claim 9 wherein the linear system of equations will be solved in terms of minimum squares.

Claim 11 (previously presented): Method of claim 1 wherein an acoustic resistor is arranged between the stimulation and the microphone.

Claim 12 (previously presented): Method of claim 11 wherein the sensitivity of acoustic resistor is optimized with respect to microphone errors.

Claim 13 (previously presented): Method of claim 1 wherein a frequency and/or impedance specific weighting of the linear systems of equation is performed.

Claim 14 (previously presented): A method for the determination of the acoustic impedance of cavities, such as an ear in connection with a hearing aid, comprising the steps of:

- arranging a probe with a microphone and a speaker at the area to be measured;
- sending out acoustic signals over the speaker into the cavity and receiving again over the microphone;
- transforming the received signals by the microphone into electrical signals and transferring them to an analysis unit;

- using a previously defined stimulation input to a twoport chain transfer matrix as a calculation base for the impedance Z,
- wherein the voltage ratio between the stimulation and the impedance is described as a dimensionless transfer function in a form of a complex function of the stimulation frequency;
- generating a series of acoustic calibration signals by a number of known acoustic impedances covering different calibration scopes by means of the defined stimulation;
- recording the calibration signals received by the microphone and merging the electric values together with the respective voltage values of the stimulation for the an evaluation of the results of the respective transfer functions;
- merging together the transfer functions of the calibration signals into an over-determined linear system of equations and solving the system of equations for calculating and storing two coefficients; determining the impedance Z to be calculated by evaluating the transfer function by use of the two coefficients; and
- outputting the determined impedance Z for use by an external entity.

Claim 15 (previously presented): Method of claim 14 wherein two series connected twoport chain matrices are used, and wherein the microphone is arranged between the output of the first twoport and the input of the second twoport.

Claims 16-17 (canceled).

Claim 18 (previously presented): Method of claim 1 for measuring the impedances of hearing devices, part systems of hearing devices, shells of hearing devices, and vents of hearing devices.

Claim 19 (previously presented): Method of claim 14 for measuring the impedances of hearing devices, part systems of hearing devices, shells of hearing devices, and vents of hearing devices.

Claim 20 (original): Method of claim 1 for measuring the impedances in the field of quality control, preferably the quality control of hearing device transducers, porous bodies, membranes and textiles.

Claim 21 (previously presented): Method of claim 14 for measuring the impedances in the fields of quality control of hearing device transducers, porous bodies, membranes, and textiles.

Claim 22 (previously presented) Apparatus of claim 17 for the measuring of the impedances of hearing devices, part systems of hearing devices, shells of hearing devices, and vents of hearing devices.

Claim 23 (previously presented): Apparatus of claim 17 for the measuring of the impedances of hearing devices, part systems of hearing devices, shells of hearing devices, and vents of hearing devices.

Claim 24 (canceled).

Claim 25 (previously presented): Apparatus of claim 17 for measuring the impedances in the field of quality control of hearing device transducers, porous bodies, membranes, and textiles.

Claim 26 (previously presented): An apparatus for the determination of an acoustic impedance Z comprising:

a probe;

a microphone;

a speaker;

an acoustic resistor arranged between the speaker and an exit opening within a connecting channel connecting to one of the microphone and an exit of the probe; and

an analysis unit for receiving electrical signals from the microphone, and for determining an impedance Z, wherein

a series of acoustic calibration signals of a number of known acoustic impedances covering different

calibration scopes are generated by means of a predefined stimulation for output by the probe for reception by the microphone, and wherein

the analysis unit comprises a function for solving an over-determined linear system of equations in terms of minimum squares by use of at least three of said acoustic calibration signals.

Claim 27 (canceled).